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FOREST PEST MANAGEMENT

3430
BIOLOGICAL
EVALUATION R2-80-7

Winter Drying Injury on
Conifers, Pikes Peak Ranger
District, Pike and San Isabel
National Forests

JULY 1980



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Forest Pest Management
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ABSTRACT

Winter drying injury or "red belt" was observed in several canyons west of Colorado Springs, Colorado during May 1980. The damage occurred within a fairly distinct elevation band above 7,500 feet and injured coniferous species included Douglas-fir, ponderosa pine, limber pine and Rocky Mountain juniper. Although trees in some cases were entirely red-brown in color, cambial tissues of twigs and buds were live. It is expected trees will recover from the damage and little or no mortality is expected.

It is believed the initial damage occurred during January as "chinook" winds caused excessive desiccation of tree crowns while soil was frozen and trees could not replace water loss.

INTRODUCTION

On May 12, 1980 Dave Johnson, Ken Lister and Randy Fuller (FIDM) met with representatives of the Pikes' Peak Ranger District, Pike and San Isabel National Forests (Steve Deitemeyer, District Ranger; Paul Ruder and Dave Zimmerman, Foresters) to evaluate the cause of damage to ponderosa pine and Douglas-fir in several canyons west of Colorado Springs, Colorado. During the past two months the District had received calls from concerned landowners regarding a general dying of ponderosa pine and Douglas-fir in the vicinity of North and South Cheyenne Creek Canyons and Ruxton Creek, along the cog railway.

OBSERVATIONS

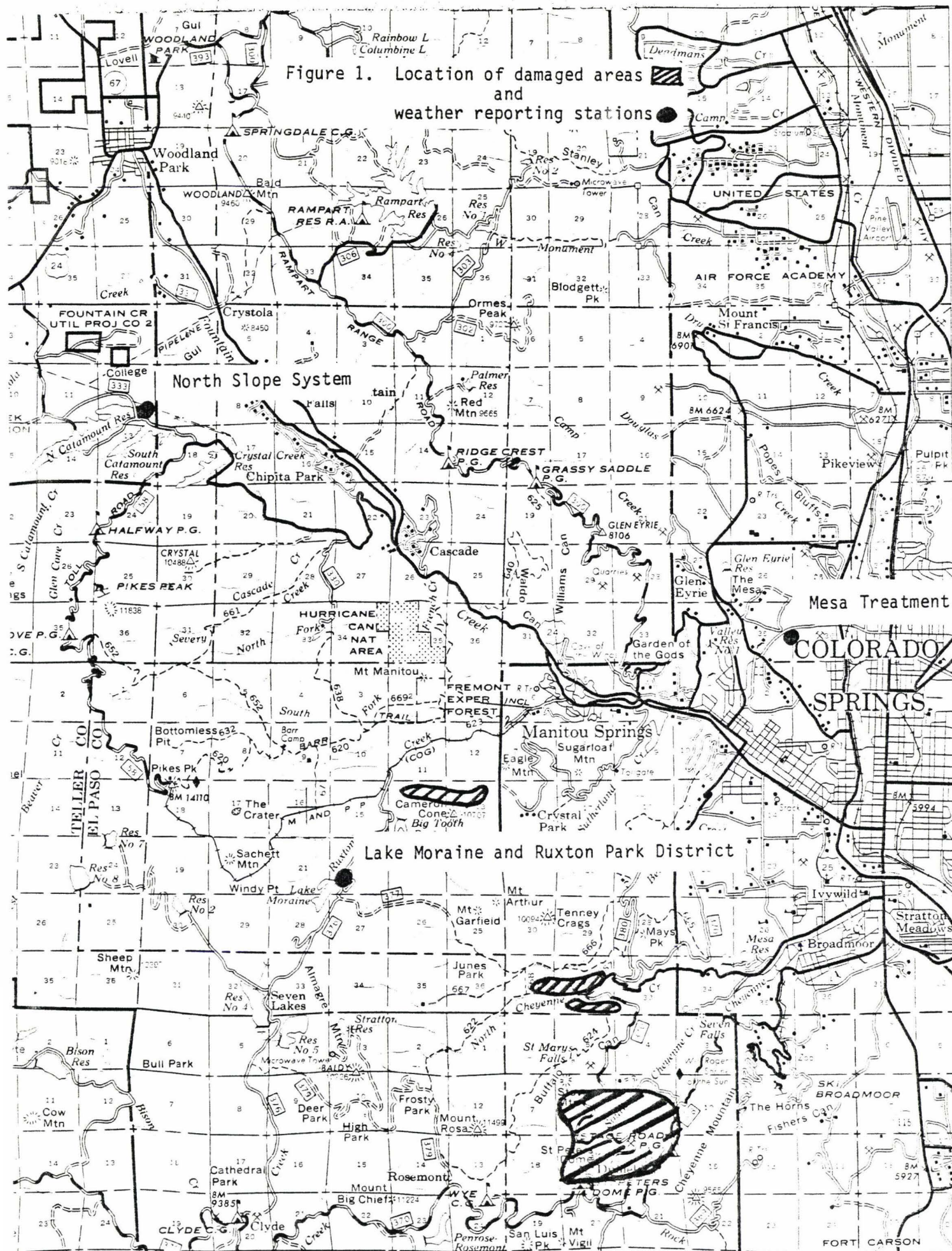
The first area visited was North Cheyenne Creek Canyon (T. 14 S., R. 67 W., Sections 31 and 32) (Fig. 1). A general "reddening" of conifers within a fairly sharply defined elevation band (between 7500 to 8000 feet) was highly visible (Fig. 2). Along the south slope, a ponderosa pine plantation established during the 1930's was examined. The crowns of these trees appeared to be entirely red-brown at a distance (Fig. 3); however, upon close examination needles were green at the base (Fig. 4); twigs and buds were live as evidenced from underlying green tissue (Fig. 5). Needles of all ages were affected. Trees, presumably from the same seed source, exhibited degrees of injury. The soil was shallow, of granitic origin. The site is marginal for timber production, as seen by poor growth over the past.

Minor damage to pine was caused by needle miners, *Coleotechnites ponderosae* and pine budworm, *Choristoneura lambertiana*.

Directly across the canyon, Douglas-fir, on north slopes, exhibited similar symptoms. These stands were also damaged by the western spruce budworm, *Choristoneura occidentalis*, and Douglas-fir dwarf mistletoe, *Arceuthobium douglasii*. Limber pine and Rocky Mountain juniper also were injured. Seedlings in some instances escaped injury. Several small trees about four feet in height were observed with only the upper two feet injured (Fig. 6). Evidently foliage under snow cover was protected and no injury occurred.

The next stop was along Ruxton Creek near the cog railway and aerial tram (T. 14 S., R. 68 W., sections 13 and 14) (Fig. 1). From our viewpoint at the cog railroad depot, Douglas-fir stands along the north and east-facing slopes were injured. Because of inaccessibility, no close observations were made; however, damage appeared generally to occur within the same elevation band as the previously described area. Budworm activity was also evident.

Figure 1. Location of damaged areas  and weather reporting stations 



T.12S.

T.13S.

T.14S.

T.15S.



Figure 2. Band of damaged Douglas-fir in North Cheyenne Creek Canyon, Colorado. This type of injury is commonly referred to as "red belt".



Figure 3. Ponderosa pine plantation injured by red belt, North Cheyenne Creek Canyon, Colorado.



Figure 4. Ponderosa pine damaged by red belt. Needles green at base. All ages of needles affected.



Figure 5. Ponderosa pine damaged by red belt. Outer bark removed to show green cambium and live bud.



Figure 6. Ponderosa pine seedling injured by red belt, North Cheyenne Canyon, Colorado. Portion of tree covered by snow during winter is green, exposed portion red brown.

The last stop was along south Cheyenne Creek Canyon (T. 15 S., R. 67 W., sections 8, 9, 16, and 17) (Fig. 1). Damage was noticeable above 7,500 feet throughout native Douglas-fir and native ponderosa pine stands. Damage was similar to that observed in previous areas. Trees had a general red-brown color at a distance. Close examination revealed all ages of needles affected; twigs and buds showed little or no damage.

Spruce budworm and dwarf mistletoe were common on Douglas-fir in this area. Stands of Douglas-fir were overly dense and in need of thinning, although the site was marginal for timber production. Fuel loadings in this area were of concern to District Ranger Deitemeyer.

DISCUSSION

The damage described in these three areas resembles that described in several reports dating back to 1930-31, 1931-32, and 1952-53 on the Pike National Forest (6) and in 1960 on the Roosevelt and Medicine Bow National Forests (7). Several of these reports describe the condition we noted almost exactly and in some instances damage occurred in the same areas in the vicinity of the old Fremont Experimental Station, Mt. Manitou, and South Cheyenne Creek Canyon. Damage was noted within an elevation band of 8,000 to 9,000 feet and involved all tree species.

The injury described in these early reports was attributed to "chinooks" and is commonly referred to as "red belt" (1, 5). Chinooks occur when air of Pacific origin moves over the Rocky Mountains and is dried and warmed by subsidence as it flows over high mountains and through east-west passes during the winter. Chinooks move along a "belt" on the contour remaining above a pool of cold indigenous valley air. Along this contour rapid warming and drying occurs resulting in excessive transpiration of moisture from exposed foliage. Uptake of moisture by roots in frozen soil is inadequate to replace the loss by transpiration. Desiccation of the foliage occurs resulting in a red belt across affected slopes (5). This same phenomenon has been reported in other areas of Colorado on lodgepole pine (3, 7) and in Montana on several coniferous species (2, 3) and near Banff-Lake Louise, Alberta, Canada on lodgepole pine (4, 5).

The red belt phenomenon as an explanation for the recent damage is further substantiated by weather records obtained from the city of Colorado Springs Public Utilities for November 1, 1979 to April 30, 1980. Figure 1 shows the location of three reporting stations (Mesa Treatment, Lake Moraine and Ruxton Park District, and North Slope System). Mesa Treatment. (T. 13 S., R. 67 W., Sec. 35) located at the west side of Colorado Springs - elevation 6,300 feet, recorded 3 days of extremely cold temperatures during January 26-28 (day 87-89, Fig. 7). Maximum and minimum temperatures remained below 0° F followed by warmer temperatures, thereafter. A pool of cold air apparently settled over the city during

this period; whereas, temperatures at Lake Moraine and Ruxton Park District, (T. 14 S., R. 68 W., Sec. 21) located 5 miles southwest of Manitou Springs at Lake Moraine - elevation 10,000 feet, recorded relatively warmer maximum and minimum temperatures (Fig. 8). Evidence of warmer temperatures within an elevational band between 6,300 and 10,000 feet (recall that the injury we observed was located above 7,500 feet) is found in data recorded at North Slope System (T. 13 S., R. 69 W., Sec. 12) located 5 miles northwest of Cascade at North Catamount Reservoir - elevation 9,340 feet. Maximum and minimum temperatures for these 3 days were higher than either of the other stations (Fig. 9) suggesting that a band of warmer air had passed through the region.

RECOMMENDATIONS

Since the injury described resulted from a naturally-occurring weather phenomenon, nothing can be done to alleviate the current damage or prevent similar instances in the future. As described, this type of injury has occurred in these same areas in the past and can be expected to occur infrequently in the future.

The affected areas may remain unsightly until uninjured buds flush this spring and dead needles fall. Little tree mortality is expected; some growth loss is expected to result since all ages of needles were injured.

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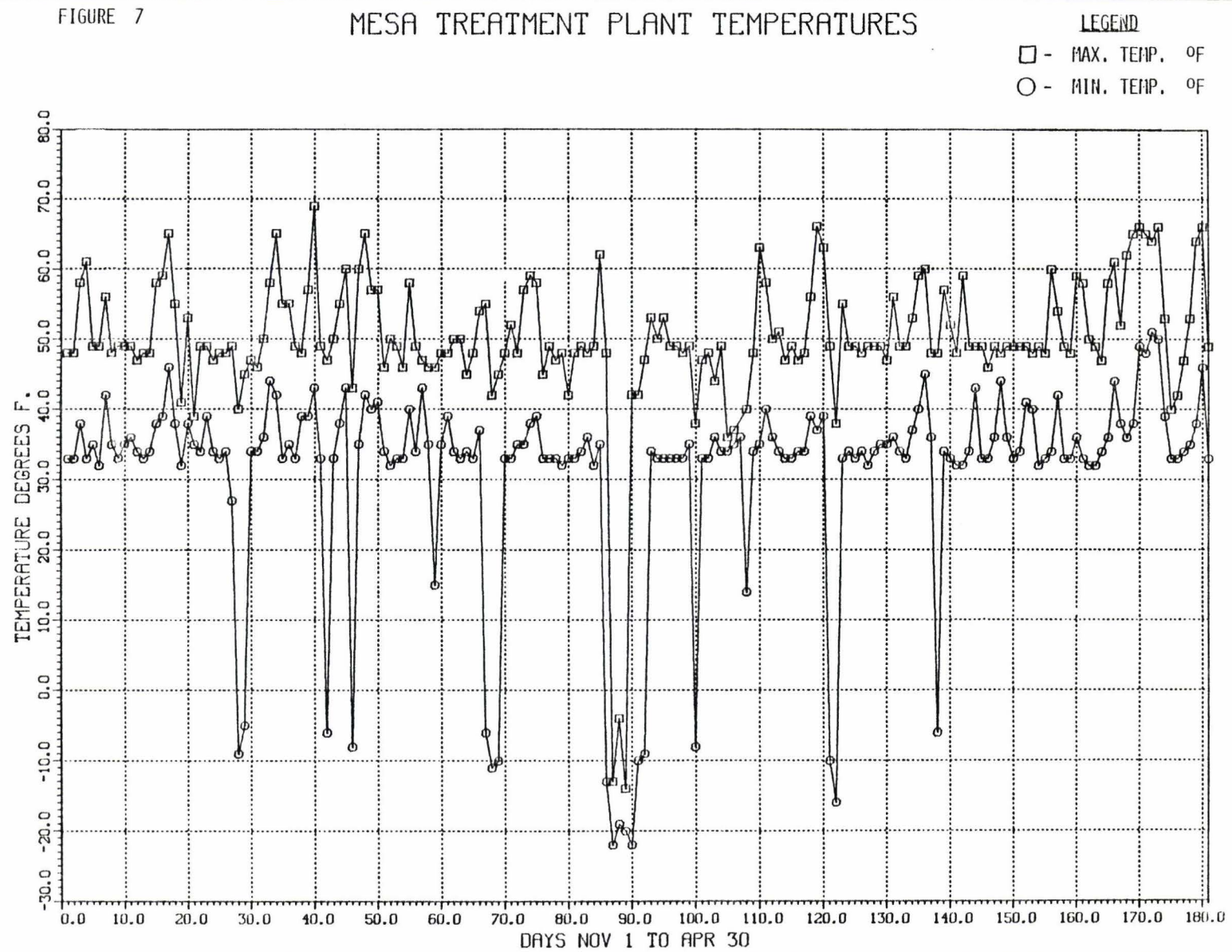


FIGURE 8

LAKE MORAINE AND RUXTON PARK DISTRICT TEMPERATURES

LEGEND

□ - MAX. TEMP. °F

○ - MIN. TEMP. °F

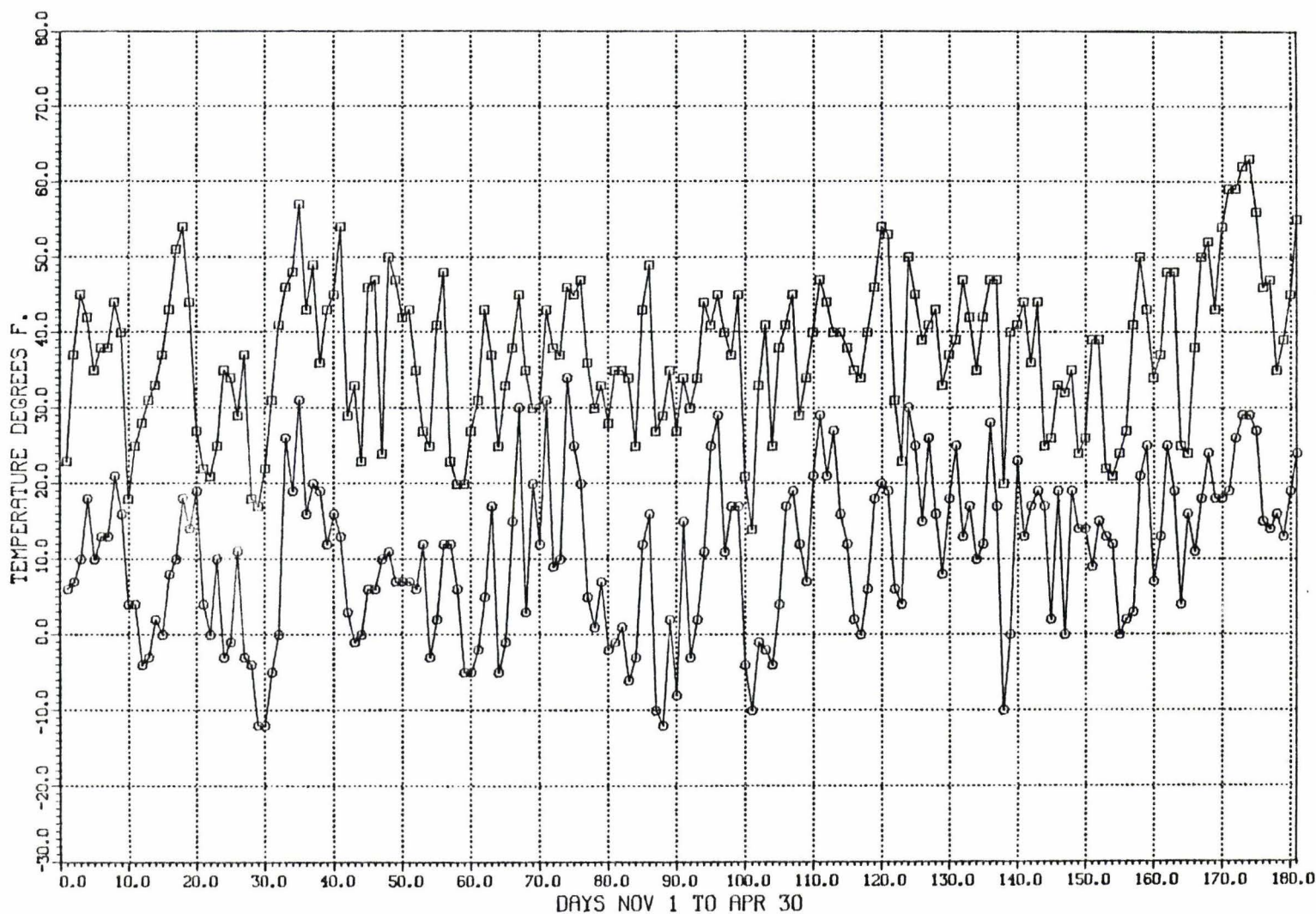
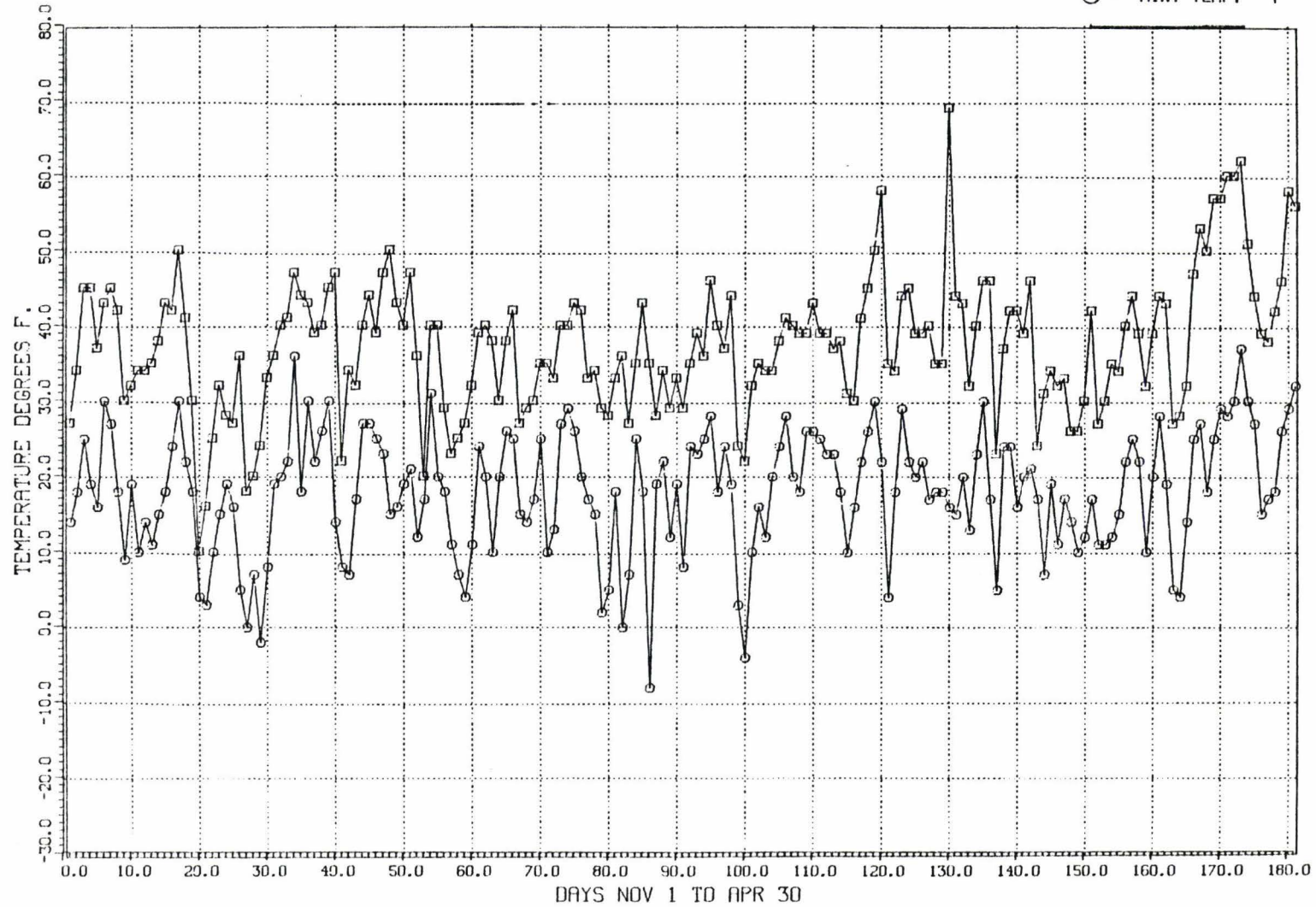


FIGURE 9

NORTH SLOPE SYSTEM TEMPERATURES

LEGEND

- - MAX. TEMP. °F
- - MIN. TEMP. °F



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